

[0138] forming a combined image from the pair of digital images;

[0139] segmenting the combined image, using the disparity map, to comprise a foreground region and a background region;

[0140] forming, from the sequentially formed combined images, synthesized panning images so that for each combined image:

[0141] a perspective shift is applied between the foreground region and background region; and

[0142] a shifting portion of the image is cropped;

[0143] when the computer program is run on a processor.

[0144] The computer program of the tenth or eleventh example aspect may be a computer program product comprising a computer-readable medium bearing computer program code embodied therein for use with a computer.

[0145] Any foregoing memory medium may comprise a digital data storage such as a data disc or diskette, optical storage, magnetic storage, holographic storage, opto-magnetic storage, phase-change memory, resistive random access memory, magnetic random access memory, solid-electrolyte memory, ferroelectric random access memory, organic memory or polymer memory. The memory medium may be formed into a device without other substantial functions than storing memory or it may be formed as part of a device with other functions, including but not limited to a memory of a computer, a chip set, and a sub assembly of an electronic device.

[0146] Different non-binding example aspects and embodiments of the present invention have been illustrated in the foregoing. The embodiments in the foregoing are used merely to explain selected aspects or steps that may be utilized in implementations of the present invention. Some embodiments may be presented only with reference to certain example aspects of the invention. It should be appreciated that corresponding embodiments may apply to other example aspects as well.

BRIEF DESCRIPTION OF THE DRAWINGS

[0147] For a more complete understanding of example embodiments of the present invention, reference is now made to the following descriptions taken in connection with the accompanying drawings in which:

[0148] FIG. 1 shows a schematic system for use as a reference with which some example embodiments of the invention can be explained;

[0149] FIG. 2 shows a block diagram of the imaging apparatus of FIG. 1;

[0150] FIG. 3 shows a block diagram of an imaging unit according to an example embodiment of the invention;

[0151] FIGS. 4a to 4d show fields of view of two digital image capture units with illustrative crop image correspondence;

[0152] FIGS. 5a to 5d show similar fields of view of the two digital image capture units when optical image stabilization is utilised;

[0153] FIG. 6 shows a flow chart illustrative of a process according to an example embodiment e.g. for capturing still images with synthesized panning effect; and

[0154] FIG. 7 shows a flow chart illustrative of a process 700 according to an example embodiment e.g. for capturing video image with synthesized panning effect.

DETAILED DESCRIPTION OF THE DRAWINGS

[0155] An example embodiment of the present invention and its potential advantages are understood by referring to FIGS. 1 through 7 of the drawings. In this document, like reference signs denote like parts or steps.

[0156] The following description first describes various generic structures suitable for implementing some example embodiments after which more specific structures and examples on some processes are described.

[0157] FIG. 1 shows a schematic system 100 for use as a reference with which some example embodiments of the invention can be explained. The system 100 comprises a device 110 such as a camera phone, gaming device, security camera device, personal digital assistant, tablet computer or a digital camera having an imaging unit 120 with a field of view 130. The device 110 further comprises a display 140. FIG. 1 also shows a user 105 and an image object 150 that is being imaged by the imaging unit 120 and a background 160 such as a curtain behind the image object.

[0158] In FIG. 1, the image object 150 is relatively small in comparison to the field of view at the image object 150. Next to the image object 150, there is a continuous background 160 and a secondary object 155. While this setting is not by any means necessary, it serves to simplify FIG. 1 and description of some example embodiments of the invention.

[0159] FIG. 2 shows a block diagram of an imaging apparatus 200 of an example embodiment of the invention. The imaging apparatus 200 is suited for operating as the device 110. The apparatus 200 comprises a communication interface 220, a host processor 210 coupled to the communication interface module 220, and a memory 240 coupled to the host processor 210.

[0160] The memory 240 comprises a work memory and a non-volatile memory such as a read-only memory, flash memory, optical or magnetic memory. In the memory 240, typically at least initially in the non-volatile memory, there is stored software 250 operable to be loaded and executed by the host processor 210. The software 250 may comprise one or more software modules and can be in the form of a computer program product that is software stored in a memory medium. The imaging apparatus 200 further comprises a pair of digital image capture units 260 and a viewfinder 270 each coupled to the host processor 210. The viewfinder 270 is implemented in an example embodiment by using a display configured to show a live camera view. The digital image capture unit 260 and the processor 210 are connected via a camera interface 280.

[0161] The two digital image capture units 260 are formed in one example embodiment by two digital cameras. In another example embodiment, the two digital image capture units are formed of a common digital camera and of an optical image splitter with two offset and substantially parallel image input ports. Thus, one portion of an image sensor is used to capture one digital image and another portion of the image sensor is used to capture another digital image. The optical image splitter comprises, for example, one or more components selected from a group consisting of mirrors; prisms; afocal optical elements; exit pupil expanders; and focal optical elements. For example, a common image sensor can be arranged in between the two input ports and optically connected thereto.

[0162] In an example embodiment, the pair of digital images have substantially overlapping fields of view.